Progress on Dilepton Generator using GRACE

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—— Outline ——

- Hadron Generation in Quasi-elastic Processes
- Merging All Processes in One Executable
- Multi-process Generation

Hadron Generation in Quasi-elastic Processes

Method as used in the non-diffractive process simulated by EPSOFT generator which is based on HERWIG.

1. Determination of # of charged particles as a function of W (γp CM energy) according to Negative Binomial Distribution

2. Particle generation

3. Assignment of P_t for each particle according to
$$\frac{d\mathcal{P}}{dP_t^2} \sim e^{-b\sqrt{P_t^2+m^2}}$$

4. Assignment of P_l for each particle according to energy-momentum conservation

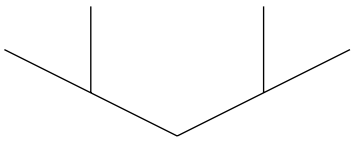
Merging All Processes into One Executable

- Lepton-pair $\cdots$ e^+e^-, $\mu^+\mu^-$, $\tau^+\tau^-$ $\longrightarrow$ 3

$\times$

- Proton side $\cdots\cdots$
  - Elastic $\longrightarrow$ 1
  - $+$
  - Quasi-elastic $\longrightarrow$ 1
  - $+$
  - DIS $\longrightarrow$ 12

$\longrightarrow$ = 42 processes in one executable



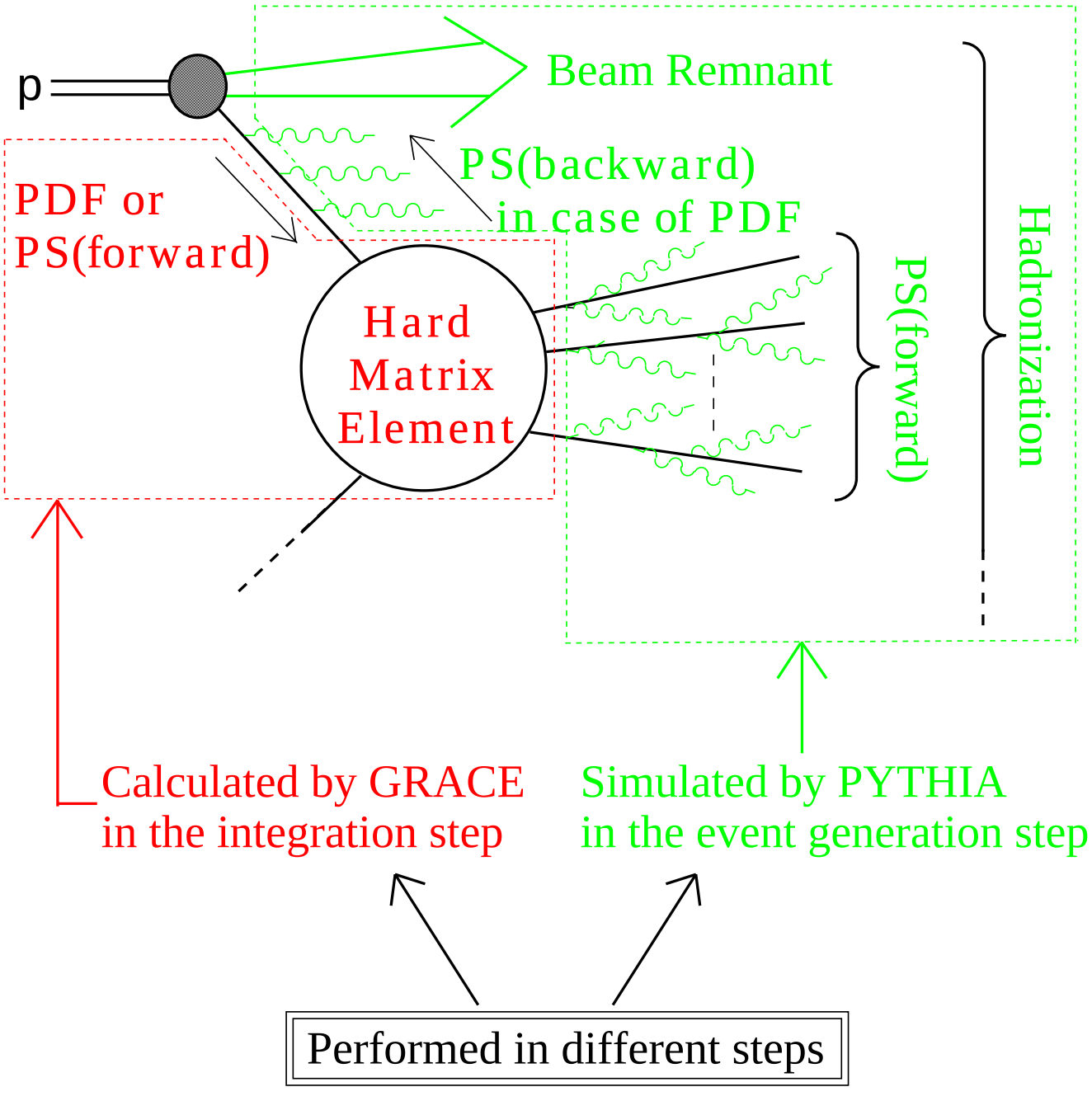
User can specify one of the processes in an input file.

Multi-process Generation

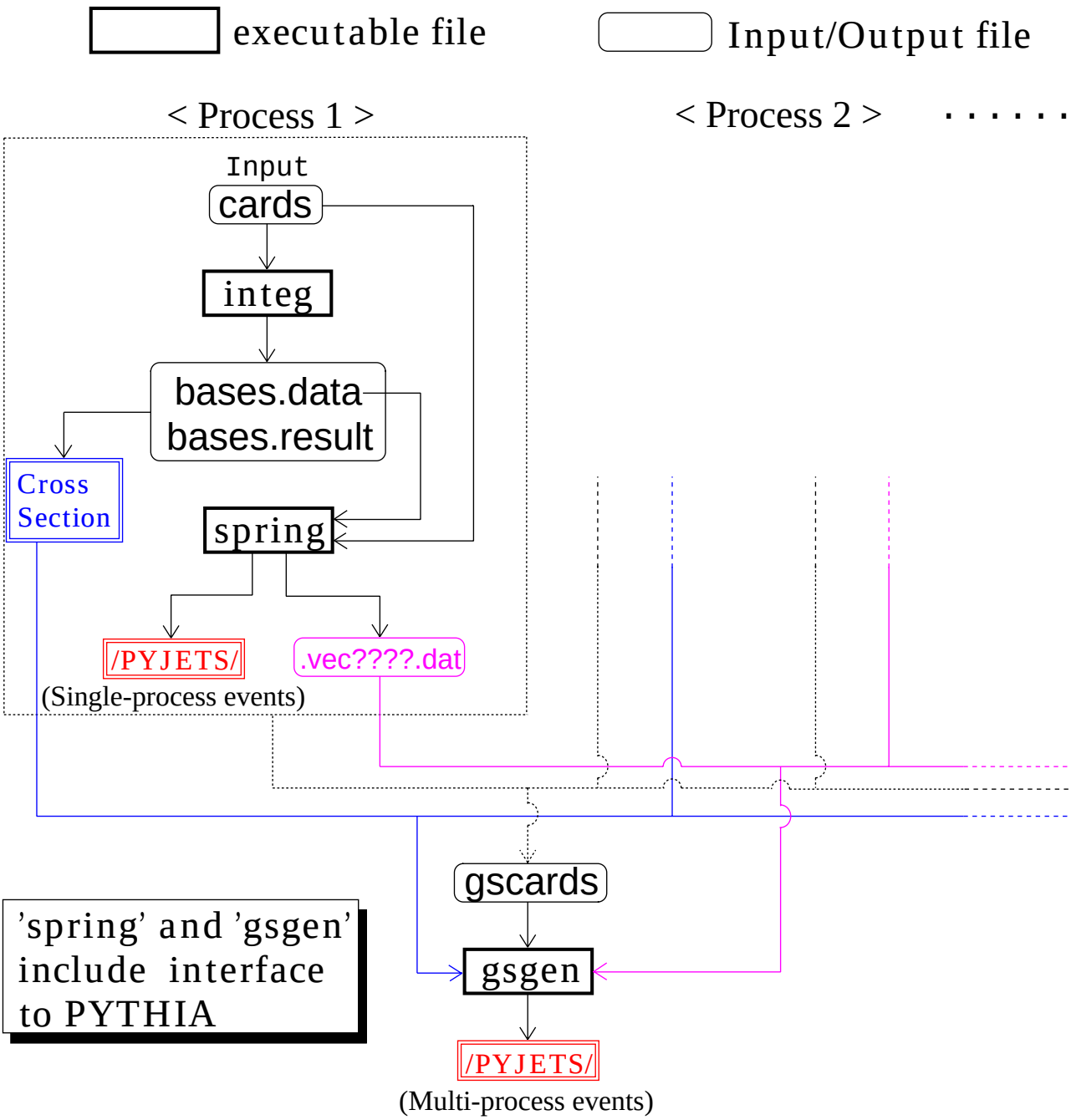
Review of the GRACE system

1. Specification of a model file, order of perturbation, and initial/final state particles
2. Generation of all Feynman diagrams
3. Generation of FORTRAN source code to calculate the Feynman amplitudes
4. Integration by BASES $\Longrightarrow$ Cross-section
5. Event generation by SPRING $\Longrightarrow$ Unweighted events

Share of Calculation



Flow of generation



cards

```
C ================================================================
C << Momenta of initial state particles(lepton/proton) in MeV >>
C             |||
EBEAM       27567
PBEAM      820976
C             |||
C ================================================================
C << Process for the proton side >>
C   (1:elastic, 2:quasi-elastic, 3:DIS)
PROCESS       1
C ================================================================
C << Produced lepton-pair >>  (1:di-e, 2:di-mu, 3:di-tau)
LPAIR         2
C ================================================================
C << Feynman graph selection >>
C   (1:BH(direct), 2:BH, 3:QED, 4:EW)
GRASEL        2
C ================================================================
C << PDF set >>
NGROUP        4
NSET         32
C ================================================================
C ################################################################
C ================================================================
C << BASES parameters >>
ITMX1         5
ITMX2         5
NCALL   2000000
C --- kinematics tuning ---
ISYM34        0
I34           3
RESNS56      -1
RESNS456     -1
NREG          2
C ================================================================
C ################################################################
C ================================================================
C << SPRING parameters >>
NGEN         10
MXTRY     10000
C ================================================================
C << PYTHIA parameters >>
PSISR         1
PSFSR         1
PSBRA         2
PSSUP         0
PYDECAY       1
PRIPT         0
C ================================================================
C ################################################################
C ================================================================
C << Cuts >>
C
THMIN         0.     0.     0.     0.
THMAX       180.   180.   180.   180.
EMIN          0.     0.     0.     0.
EMAX      99999. 99999. 99999. 99999.
PMIN          0.     0.     0.     0.
PMAX      99999. 99999. 99999. 99999.
PTMIN         0.     0.     0.     0.
PTMAX     99999. 99999. 99999. 99999.
C
MASSMIN       0.
MASSMAX   99999.
C ================================================================
```

gscards

```
LIST
KEYS
C ======================================================================
C << MGEN parameters >>
NGEN         10
NPRC          2
SUBDIR      ' '   ' '   ' '   ' '   ' '   ' '   ' '   ' '   ' '
C
C ======================================================================
C << Output of generated events >>
PYLIST      TRUE
NLIST         10
NTUPLE     FALSE
C ======================================================================
C << PYTHIA parameters >>
PSISR         0
PSFSR         0
PSBRA         2
PSSUP         0
PYDECAY       1
PRIPT         0
C ======================================================================
C << Misc. >>
EMINISR       1E-20
ROTPY       TRUE
QELAX       TRUE
C ======================================================================
C
STOP
```